

**TITLE OF THE INVENTION**

**ELECTRICAL CONTACTING APPARATUS IN INK JET PRINTER**

**CLAIM OF PRIORITY**

**[0001]** This application makes reference to, incorporates the same herein, and claims all benefits accruing under 35 U.S.C. §119 from my application entitled *Apparatus For Electrical Contact Of Inkjet Printer* filed with the Korean Industrial Property Office on 22 January 2001 and there duly assigned Serial No. 2001/3584.

**BACKGROUND OF THE INVENTION**

**Field of the Invention**

**[0002]** The present invention relates to an electrical contacting apparatus in an ink jet printer, and more particularly, to a contacting apparatus for electrical connection between an ink cartridge and a carrier.

**Description of the Related Art**

**[0003]** General ink jet printers are output apparatuses in which an ink cartridge installed in a carrier that sprays ink onto the surface of paper while moving horizontally, so that pictures or characters are printed.

**[0004]** This printing is performed by an ink cartridge, which is installed in a carrier, receiving an electrical signal from the main board of a computer and spraying ink. Here, an ink cartridge is

electrically connected to a carrier in which an ink cartridge is to be installed.

## SUMMARY OF THE INVENTION

**[0005]** It is an object of the present invention to improve the quality of printing of ink-jet printers.

**[0006]** It is also an object of the present invention is to provide an electrical contacting apparatus for improving the quality of printing by reducing the contact resistance at the contact surface contacting the contact portions of an ink cartridge using a spring elastic member.

**[0007]** It is also an object of the present invention to have the spring elastic members form electrical contact with a printed circuit board and with contact portions of an ink cartridge.

**[0008]** It is further an object of the present invention to provide spring elastic members that provide constant contact force without affecting adjacent spring elastic members.

**[0009]** It is also an object of the present invention to provide spring elastic members that provide constant contact force to the contact portions of an ink cartridge even though the spring elastic members contacts the contact portions of the ink cartridge for a long period of time.

**[0010]** To achieve the above objects, the present invention provides an electrical contacting apparatus in an ink jet printer, for contacting the contact portions of an ink cartridge with the contact portions of a printed circuit board installed on a carrier in order to electrically connect the ink cartridge to the carrier on which the ink cartridge is mounted, the apparatus including a plurality of spring elastic members corresponding to the contact portions of the ink cartridge. In this apparatus, each of the spring elastic members includes a contact portion which contacts a contact portion of the ink cartridge; a base having one end electrically connected to the printed circuit board; and a

connection portion connected to the contact portion and the base for providing an elastic restoration force between the contact portion and the base.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0011] A more complete appreciation of the invention, and many of the attendant advantages thereof, will be readily apparent as the same becomes better understood by reference to the following detailed description when considered in conjunction with the accompanying drawings in which like reference symbols indicate the same or similar components, wherein:

[0012] FIG. 1 is an exploded perspective view of an ink cartridge and a carrier for an ink jet printer including an existing electrical contacting apparatus;

[0013] FIG. 2 is a cross-sectional view illustrating the contact portions of the ink cartridge and the contact portions of the flexible printed circuit board (FPCB) of FIG. 1 in greater detail;

[0014] FIG. 3 is an exploded perspective view illustrating the major parts of an ink jet printer including an electrical contacting apparatus according to the present invention; and

[0015] FIG. 4 is a cross-sectional view of the electrical contacting apparatus of the ink jet printer of FIG. 3.

### DETAILED DESCRIPTION OF THE INVENTION

[0016] FIGS. 1 and 2 show an ink jet printer having an electrical contact structure. FIG. 1 shows an ink cartridge and a carrier which are separated from each other, and FIG. 2 shows magnified cross-sections of a contact portion of the ink cartridge and a flexible printed circuit board (FPCB)

when the ink cartridge is installed in the carrier.

**[0017]** Referring to FIGS. 1 and 2, the ink jet printer includes an ink cartridge 10 having a nozzle portion for spraying ink, a carrier 20 which installs the ink cartridge 10 and horizontally moves, and an FPCB 26 for transmitting an electrical signal between the ink cartridge 10 and the carrier 20.

**[0018]** On one side of the ink cartridge 10 to be installed in the carrier 20 are formed a plurality of contact portions 12 for electrically connecting the ink cartridge to the FPCB 26. The carrier 20 includes a printed circuit board (PCB) 24 for receiving an electrical signal from and transmitting the same to the main board of a computer via a flexible cable (not shown). The PCB 24 is electrically connected to one end of the FPCB 26. The FPCB 26 has a plurality of contact portions 22 that correspond to the contact portions 12 of the ink cartridge 10.

**[0019]** As shown in FIG. 2, the contact portions 22 on the FPCB 26 protrude. Thus, when the ink cartridge 10 is installed on the carrier 20, the contact portions 12 of the ink cartridge 10 contact the contact portions 22 of the FPCB 26. In order for the ink jet printer to perform normal printing, the contact portions 12 of the ink cartridge 10 must apply a contact force to the contact portions 22 of the FPCB 26. In order to achieve this, the FPCB 26 has a rubber elastic member 30 formed on its bottom surface. In this case, the rubber elastic member 30 has a plurality of protrusions 32 corresponding to the protruding contact portions 22 of the FPCB 26.

**[0020]** In the electrical contacting apparatus having such a structure in an ink jet printer, if the heights of some of the plurality of protrusions 32 formed on the rubber elastic member 30 are inconsistent or the contact surface of the rubber elastic member 30 is not flat, a contact force is not applied equally to adjacent protrusions. Thus, contact resistance increases. Consequently, ink is not

properly sprayed from the nozzle portion of the ink cartridge.

**[0021]** Referring to FIGS. 3 and 4, a carrier 120 in which an ink cartridge 10 is installed to receive an output signal from the main board (not shown) of a computer and perform printing includes a printed circuit board 124 for transmitting and receiving the output signal . A flexible cable (not shown) is attached to one side of the printed circuit board 124 and connected to the main board. The printed circuit board 124 has a plurality of contact portions 126 via which an electrical signal is transmitted. A plurality of contact portions 12 for electrical connection are formed on one side of the ink cartridge 10 as described above.

**[0022]** A contacting apparatus using a plurality of spring elastic members 130 as an apparatus for electrically connecting the contact portions 12 of the ink cartridge 10 to the contact portions 126 of the printed circuit substrate 124 is installed on the printed circuit board 124. The spring elastic member 130 is made up of a contact portion 132, a base 131 and a connection portion 133. The contact portion 132 contacts the contact portions 12 of the ink cartridge 10 when the ink cartridge 10 is mounted on the carrier 120. One end of the base 131 is coupled to a contact portion 126 of the printed circuit board 124. In this embodiment, one end of the base 131 is combined with the contact portion 126 of the printed circuit board 124 by soldering. The connection portion 133 is connected to the contact portion 132 and the base 131, so that it provides an elastic restoration force between the contact portion 132 and the base 131. Preferably, the spring elastic member 130 having such a structure is formed of a material with which a constant contact force can be continuously applied to the contact portions 12 of the ink cartridge 10 even though the contact portion 132 contacts the contact portions 12 of the ink cartridge 10 for a long period of time. In this embodiment, phosphor

bronze plated with nickel having a thickness of 0.5 to 20  $\mu\text{m}$  is used, and the surface of the contact portion 132 is further plated with gold having a thickness of 0.1  $\mu\text{m}$  or greater. Preferably, the thickness of nickel is 1.27  $\mu\text{m}$ , and the thickness of gold is 0.3  $\mu\text{m}$ .

**[0023]** In addition, a housing 140 for receiving a plurality of spring elastic members 130 is provided, and maintains the elastic force of the contact portion 132 with respect to the base 131 of the spring elastic member 130. Thus, the housing 140 has a space 143 into which the spring elastic member 130 is received. A window 145 is formed on an opening 135 of the housing 140 at one side of the space 143, the opening facing the contact portions 12 of the ink cartridge 10, so that each of the contact portions 132 of the spring elastic member 130 is exposed to the outside and contacts each of the contact portions 12 of the ink cartridge 10.

**[0024]** In this structure, when the ink cartridge 10 is mounted on the carrier 120, the contact portions 12 of the ink cartridge 10 individually contact the contact portions 132 of the spring elastic member 130 exposed to the outside of the window 145 of the housing 140, so that a constant contact force is applied to each of the contact portions 132 without affecting adjacent contact portions 132.

**[0025]** In an ink jet printer having such a structure, when an output signal from the main board of a computer is transmitted to the printed circuit board 124 of a carrier, it is transmitted to the ink cartridge 10 via the contacting apparatus installed on the printed circuit board 124, whereby printing is performed. That is, the signal which has reached the printed circuit board 124 is transmitted to the base 131 of the spring elastic member 130 combined with each of the contact portions 126 of the printed circuit board 124 and then transmitted to the contact portion 132 via the connection portion 133. Next, the signal is transmitted to each of the contact portions 12 of the ink cartridge 10 which

1 contact the contact portions 132 of the spring elastic member 130. Finally, the signal which has  
2 reached the ink cartridge 10 is transmitted to a print head (not shown) on which a nozzle portion is  
3 formed, via a flexible printed circuit board (not shown) attached to the ink cartridge 10, whereby  
4 printing is performed.

5 **[0026]** As described above, the electrical contacting apparatus in an ink jet printer according to  
6 the present invention includes spring elastic members received in a housing, so that a contact force  
7 put on a contact portion of a spring elastic member which contacts an ink cartridge does not affect  
8 adjacent contact portions. Consequently, a constant contact force applied to the contact surface of  
9 the spring elastic member which contacts the ink cartridge is still maintained for a long period of  
10 time. Therefore, the contact resistance at the contact surface of a spring elastic member which  
11 contacts the contact portions of an ink cartridge is reduced, thereby improving the quality of printing  
12 of ink jet printers.